An Accelerated Program

Students from Thomas Jefferson High School for Science and Technology help accelerate HIV structural biology research.

(Photo: L. Gaudreault)

Sid Bhatia at the Thomas Jefferson High School for Science and Technology connects remotely to the Biowulf computer cluster at NIH.

The NCI has had a long history of bringing students into the lab, but has only opened its doors to high school students relatively recently. "I have been at the NCI for almost 10 years," stated Sriram Subramaniam, Ph.D., Head of the Biophysics Section of the Laboratory of Cell Biology at CCR. "In the last seven to eight years, about 70 students have been associated with my lab. Of these, about 20 were high school students, starting with one high school student whom I took on somewhat reluctantly about six years ago."

But that reluctance has since vanished. Dr. Subramaniam's lab now regularly taps into the pool of talented high school students in the area to accelerate his research in HIV structural biology. Last year, Subramaniam, Senior Research Fellow Martin Kessel, Ph.D., and their team worked together with Larry Gaudreault, a senior science teacher at the Thomas Jefferson High School for Science and Technology in Northern Virginia, to carefully select six highly motivated high school seniors for a joint project. This school was ranked the best public high school in the nation in 2007, 2008, and 2009 by *U.S. News & World Report*.

The surface structure of the HIV virus particle contains one of the most important targets in HIV/AIDS vaccine research. Only a single protein is expressed on the surface of every HIV virus—an oligoglycoprotein, informally called a spike. This spike makes contact with CD4 receptors on T cells, and this interaction is critical for HIV to enter and infect a cell. Dr. Subramaniam's lab is focused on visualizing the structure of this spike and how it varies across different strains in order to understand why some strains can be neutralized by antibodies and others cannot. Understanding these variations structurally is critical to finding an effective HIV vaccine.

"We're looking at multiple states of the same virus, how the structure changes among different viruses, and the spectrum of HIV viruses in individual patients," said Dr. Subramaniam. "We had a very large computational problem: The throughput of data was high enough that we could generate a large amount of data, but the bottleneck was converting that data into useful information. And that is where the students come in." The students work remotely, using a very powerful computer resource at NIH called the Biowulf cluster—a collection of thousands of processors that's the focal point of most of NIH's computational needs—to extract structural differences from thousands of images.

The project has indeed accelerated progress in the Subramaniam lab, and at the same time, the students get a great deal out of it, too. "It would not be successful without the team effort of our entire lab and our collective approach to science," noted Dr. Subramaniam. "The process of finding an effective way for the students to participate in our research actually sharpens our own efforts, making this a win-win partnership by accelerating our research program, while also making it exciting for the students as they work alongside senior graduate students, postdocs, and NIH scientists to contribute to NIH's scientific mission."

To learn more about Dr. Subramaniam's research, please visit his CCR Web sites at ***http://ccr.cancer.gov/staff/staff.asp?Name=Subramaniam*** *and* ***http://electron.nci.nih.gov.***